PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

INTERFERENCE AND DIFFRACTION OF LIGHT

Example

1. Light waves from two coherent sources having intensities I and 2I cross each other at a point with a phase difference of 60° . The intensity at the point will be

A. $4.414I$

B. $5.455I$

C. $4I$

D. $6.441I$

Answer: A

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2. Light waves form two coherent source having intensity ration $81:1$ produce interference. Then, the ratio of maxima and minima in the interference pattern will be

A. $\frac{18}{23}$

B. $\frac{16}{25}$

C. $\frac{25}{16}$

D. $\frac{23}{18}$

Answer: C

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3. In a Young's double-slit experiment , the slits are separated by 0.28 mm and screen is placed 1.4 m away . The distance between the central bright fringe and the fourth bright fringe is measured to be 1.2 cm . Determine the wavelength of light used in the experiment .

A. $6 \times 10^{-7} m$

B. $7 \times 10^{-7} m$

C. $10^{-7} m$

D. $6 \times 10^{-5} m$

Answer: A

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4. Two slits are made one millimeter apart and the screen is placed one metre away. When blue-green light of wavelength 500 nm is used, the fringe separation is

A. 0.1 nm

B. 0.125 nm

C. 0.5 mm

D. 0.1 mm

Answer: C

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5. In Young's double slit experiment interference fringes 1° apart are produced on the screen, the slit separation is $(\lambda = 589nm)$

A. 0.546 mm

B. 0.0337 mm

C. 0.246 mm

D. 0.0927 mm

Answer: B

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6. In a single slit diffraction experiment first minima for $\lambda_1 = 660nm$ coincides with first

maxima for wavelength λ_2. Calculate the value of λ_2.

A. 240 nm

B. 345 nm

C. 440 nm

D. 330 nm

Answer: C

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7. A single slit of width a is illuminated by violet light of wavelength $400nm$ and the width of the diffraction pattern is measured as y. When half of the slit width is covered and illuminated by yellow light of wavelength $600nm$, the width of the diffraction pattern is

A. 0

B. $\frac{y}{3}$

C. 3y

D. 4y

Answer: C

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8. Calculate the resolving power of a microscope with cone angle of light falling on the objective equal to 60°. Take $\lambda = 600nm$, μ for air $= 1$.

A. $1.67 \times 10^6 m^{-1}$

B. $1.03 \times 10^5 m^{-1}$

C. $0.67 \times 10^5 m^{-1}$

D. $8.96 \times 10^6 m^{-1}$

Answer: A

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9. A telescope is used to resolve two stars separated by 4.6×10^{-6} rad. If the wavelength of light used is 5460Å , what should be the aperture of the objective of the telescope ?

A. 0.0448 m

B. 0.1448 m

C. 1.1448

D. 0.011 m

Answer: B

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Exercise 1 Topical Problems

1. A is an essential condition for coherent sources. Here, A refers to

A. constant phase difference

B. equal amplitude

C. Both (a) and (b) are correct

D. Both (a) and (b) are incorrect

Answer: A

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2. The maximum intensity of fringes in Young's experiment is I. If one of the slit is closed, then

the intensity at that place becomes I_o. Which of the following relation is true?

A. $I = I_0$

B. $I = 2I_0$

C. $I = 4I_0$

D. $I = 0$

Answer: C

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3. The maximum intensity in the case of n identical waves each of intensity $2\frac{W}{m^2}$ is $32\frac{W}{m^2}$ the value of n is

A. 4

B. 16

C. 32

D. 64

Answer: B

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4. S_1 and S_2 are two coherent sources. The intensity of both sources are same. If the intensity at the point of maxima is $4Wm^{-2}$, the intensity of each source is

A. $1Wm^{-2}$

B. $2Wm^{-2}$

C. $3Wm^{-2}$

D. $4Wm^{-2}$

Answer: A

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5. Three waves of equal frequency having amplitudes $10\mu m$, $4\mu m$, $7\mu m$ arrive at a given point with successive phase difference of $\pi/2$, the amplitude of the resulting wave in μm is given by

A. 4

B. 5

C. 6

D. 7

Answer: B

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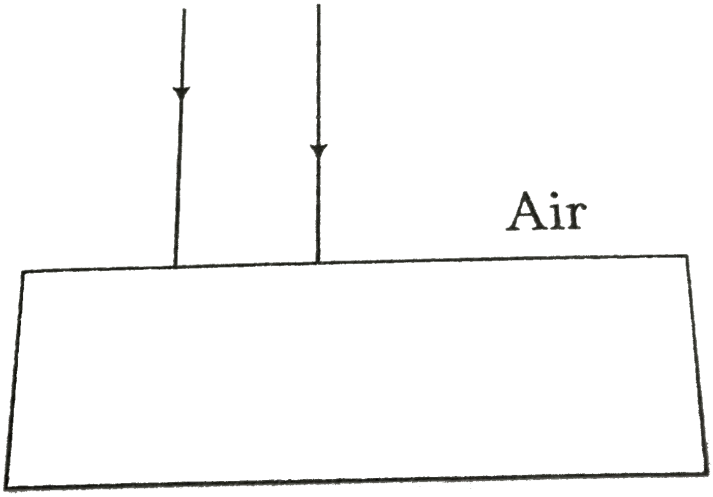
6. A parallel beam of light of intensity I is incident on a glass plate. $25\,\%$ of light is reflected in any reflection by upper surface and $50\,\%$ of light is reflected by any reflection from lower surface. Rest is refracted The ratio of maximum to minimum intensity in

interference region of reflected rays is



A. $\left(\frac{\frac{1}{2}+\sqrt{\frac{3}{8}}}{\frac{1}{2}-\sqrt{\frac{3}{8}}}\right)^2$

B. $\left(\frac{\frac{1}{4}+\sqrt{\frac{3}{8}}}{\frac{1}{2}-\sqrt{\frac{3}{8}}}\right)^2$

C. $\frac{5}{8}$

D. $\frac{8}{5}$

Answer: A

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7. Two periodic waves of intensities I_1 and I_2 pass through a region at the same time in the same direction. The sum of the maximum and minimum intensities is:

A. $I_1 + I_2$

B. $\left(\sqrt{I_1} + \sqrt{I_2}\right)^2$

C. $\left(\sqrt{I_1} - \sqrt{I_2}\right)^2$

D. $2(I_1 + I_2)$

Answer: D

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8. Interference was observed in interference chamber when air was present, now the chamber is evacuated and if the same light is used, a careful observer will see

A. interference in which width of the fringe will be slightly increased

B. Interference with bright bond

C. Interference with dark bond

D. All of the above

Answer: A

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9. Two coherent monochromatic light beams of intensities I and 4I are superposed. The maximum and minimum possible intensities in the resulting beam are

A. 5I and 3I

B. 9I and 3I

C. 4I and I

D. 9I and I

Answer: D

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10. Two coherent monochormatic light source are located at two vertices of an equilateral trangle. If the intensity due to each of the source independently is $1Wm^{-2}$ at the third vertex. The resultant intensity due to both the sources at that point (i.e at the third vertex) is (in Wm^{-2})

A. zero

B. $\sqrt{2}$

C. 2

D. 4

Answer: D

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11. Two coherent waves are represented by $y_1 = a_1 \cos_\omega$ t and $y_2 = a_2 \sin_\omega$t. The resultant intensity due to interference will be

A. $(a_1 + a_2)$

B. $(a_1 - a_2)$

C. $(a_1^2 + a_2^2)$

D. $(a_1^2 - a_2^2)$

Answer: C

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12. Two sources are called coherent if they produce waves

A. having a constant phase difference

B. of equal wavelength

C. of equal speed

D. having same shape of wavefront

Answer: A

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13. The ratio of the intensities of two waves is $16:9$. The ratio of their amplitudes is

A. $4:3$

B. $3:4$

C. $1:2$

D. $2:1$

Answer: A

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14. Match the following columns and choose the correct options from the codes given below.

A.
A	B	C	D
4	1	3	2

B.
A	B	C	D
4	3	1	2

C.
A	B	C	D
3	4	1	2

D.
A	B	C	D
3	4	2	1

Answer: C

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15. The Young's double slit experiment is performed with blue and with green light of wavelengths $4360A$ and $5460A$ respectively. If

X is the distance of $4th$ maximum from the central one, then :

A. $X_{(\text{blue})} = X_{(\text{green})}$

B. $X_{(\text{blue})} > X_{(\text{green})}$

C. $X_{(\text{blue})} < X_{(\text{green})}$

D. $X_{(\text{blue})} / X_{(\text{green})} = 5400/4360$

Answer: C

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16. In Young's experiment, the wavelength of red light is 7.8×10^{-5} cm and that of blue light is 5.2×10^{-5} cm. The value of n for which (n + 1)th blue light band coincides with nth red band is

A. 4

B. 2

C. 3

D. 1

Answer: B

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17. In Young's double-slit experiment, the separation between the slits is halved and the distance between the slits and the screen in doubled. The fringe width is

A. unchanged

B. halved

C. doubled

D. quadrupled

Answer: D

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18. In the setup shown in figure, the two slits, S_1 and S_2 are not equidistant from the slit S. The central fringe at O is, then

A. always bright

B. always dark

C. either dark or bright depending on the position of

D. neither dark nor bright

Answer: C

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19. The separation between successive fringes in a double slit arrangement is x. If the whole arrangement is dipped under water, what will

be the new fringe separation ? [The wavelength of light being used is 5000Å]

A. 1.5 x

B. x

C. 0.75 x

D. 2 x

Answer: C

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20. In a Young's double-slit experiment, let S_1 and S_2 be the two slits, and C be the centre of the screen. If $\angle S_1 C S_2 = \theta$ and λ is wavelength, the fringe width will be

A. $\frac{\lambda}{\theta}$

B. $\lambda\theta$

C. $\frac{2\lambda}{\theta}$

D. $\frac{\lambda}{2\theta}$

Answer: A

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21. In the Young's double slit experiment , a mica slip of thickness t and refractive index μ is introduced in the ray from first source S_1 . By how much distance fringes pattern will be displaced ? (d = distance between the slits and D is the distance between slits and screen)

A. $\frac{d}{D}(\mu - 1)t$

B. $\frac{D}{d}(\mu - 1)t$

C. $\frac{d}{(\mu - 1)D}$

D. $\frac{D}{d}(\mu - 1)$

Answer: B

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22. In double slit experiment, the angular width of the fringes is 0.20° for the sodium light $(\lambda = 5890\text{Å})$. In order to increase the angular width of the fringes by $10\,\%$, the necessary change in the wavelength is

A. zero

B. increased by 6479 Å

C. decreased by 589 Å

D. increased by 589 Å

Answer: D

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23. A beam of light consisting of two wavelength $650nm$ and $520nm$ is used to illuminate the slit of a Young's double slit experiment. Then the order of the bright

firnge of the longer wavelength that coincide with a bright fringe of the shorter wavelength at the least distance from the central maximum is

A. 1

B. 2

C. 3

D. 4

Answer: D

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24. In Young's double slit experiment, the 8th maximum with wavelength λ_1 is at a distance d_1 from the central maximum and the 6th maximum with a wavelength λ_2 is at a distance d_2. Then (d_1 / d_2) is equal to

A. $\frac{4}{3}\left(\frac{\lambda_2}{\lambda_1}\right)$

B. $\frac{4}{3}\left(\frac{\lambda_1}{\lambda_2}\right)$

C. $\frac{3}{4}\left(\frac{\lambda_2}{\lambda_1}\right)$

D. $\frac{3}{4}\left(\frac{\lambda_1}{\lambda_2}\right)$

Answer: B

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25. In a Young's experiment, two coherent sources are placed $0.90mm$ apart and the fringes are observed one metre away. If is produces the second dark fringe at a distance of $1mm$ from the central fringe, the wavelength of monochromatic light used would be

A. 60×10^{-4} cm

B. 10×10^{-4} cm

C. 10×10^{-5} cm

D. 6×10^{-5} cm

Answer: D

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26. The wavelength of the light used in Young's double slit experiment is λ. The intensity at a point on the screen is I, where

the path difference is $\frac{\lambda}{6}$. If I_0 denotes the maximum intensity, then the ratio of I and I_0 is

A. 0.866

B. 0.5

C. 0.707

D. 0.75

Answer: D

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27. In a double slit interference experiment, the fringe width obtained with a light of wavelength 5900 Å was 1.2 mm for parallel narrow slits placed 2 mm apart. In this arrangement. If the slit separation is increased by one-and-half times the previous value, then the fringe width is

A. 0.9 mm

B. 0.8 mm

C. 1.8 mm

D. 1.6 mm

Answer: B

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28. In an interference pattern the position of zeroth order maxima is 4.8 mm from a certain point P on the screen. The fringe width is 0.2 mm. The position of second maxima from point P is

A. 5.1 mm

B. 5 mm

C. 40 mm

D. 5.2 mm

Answer: A

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29. The ratio of intensity at the centre of a bright fringe to the intensity at a point distant one-fourth of the distance between two successive bright fringes will be

A. 4

B. 3

C. 2

D. 1

Answer: C

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30. In a Young's double slit experiment, the slit separation is $1mm$ and the screen is $1m$ from the slit. For a monochromatic light of

wavelength $500nm$, the distance of 3rd minima from the central maxima is

A. 0.50 mm

B. 1.25 mm

C. 1.50 mm

D. 1.75 mm

Answer: B

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31. In double slit experiment , the distance between two slits is $0.6mm$ and these are illuminated with light of wavelength 4800Å. The angular width of dark fringe on the screen at a distance 120 cm from slits will be

A. 8×10^{-4} rad

B. 6×10^{-4} rad

C. 4×10^{-4} rad

D. 16×10^{-4} rad

Answer: A

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32. In Young's double slit experiment, the aperture screen distance is $2m$. The fringe width is $1mm$. Light of $600nm$ is used. If a thin plate of glass $(\mu = 1.5)$ of thickness $0.06mm$ is placed over one of the slits, then there will be a lateral displacement of the fringes by

A. zero

B. 6 cm

C. 10 cm

D. 15 cm

Answer: B

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33. In a Young's double slit experiment, the fringe width is found to be $0.4mm$. If the whole apparatus is immersed in water of refractive index $4/3$ without disturbing the geometrical arrangement, the new fringe width will be

A. 0.30 mm

B. 0.40 mm

C. 0.53 mm

D. 450 μm

Answer: A

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34. In young's double slit experiment, if wavelength of light changes from λ_1 to λ_2 and

distance of seventh maxima changes from d_1 to d_2. Then

A. $\frac{\lambda_1}{\lambda_2}$

B. $\frac{\lambda_2}{\lambda_1}$

C. $\frac{\lambda_1^2}{\lambda_2^2}$

D. $\frac{\lambda_2^2}{\lambda_1^2}$

Answer: A

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35. in a two-slit experiment with monochromatic light, fringes are obtained on a screen placed at some distance from the slits. If the screen is moved by 5×10^{-2} m towards the slits, the change in fringe width is 3×10^{-5}. If the distance between the slits is 10^{-3}m, calculate the wavelength of the light used.

A. 4500 Å

B. 3000 Å

C. 5000 Å

D. 6000 Å

Answer: D

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36. In Young's double slit experiment, the intensity on the screen at a point where path difference is λ is K. What will be the intensity at the point where path difference is $\lambda/4$?

A. $K/4$

B. $K/2$

C. K

D. Zero

Answer: B

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37. In Young's double-slit experiment, the separation between the slits is halved and the distance between the slits and the screen in doubled. The fringe width is

A. becomes half

B. remains the same

C. becomes six times

D. becomes four times

Answer: C

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38. In the Young's experiment, one of the slit is covered with a transparent sheet of thickness 3.6×10^{-3} cm due to which position of

central fringe shifts to a position originally occupied by 30th bright fringe. The refractive index of the sheet, if $\lambda = 6000\text{Å}$ is

A. 1.5

B. 1.2

C. 1.3

D. 1.7

Answer: A

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39. A double slit experiment is performed with light of wavelength $500nm$. A thin film of thickness $2\mu m$ and refractive index 1.5 is introduced in the path of the upper beam. The location of the central maximum will

A. remain unshifted

B. shift downward by nearly two fringes

C. shift upward by nearly two fringes

D. shift downward by ten fringes

Answer: C

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40. In a Young's double slit experiment, the source is white light. One of the holes is covered by a red filter and another by a blue filter. In this case

A. there should be no interference fringe

B. there should be no interference pattern for red mixing with one for blue

C. there should be alternate interference patterns of red and blue

D. None of the above

Answer: A

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41. A small aperture is illuminated with a parallel beam of $\lambda = 628nm$. The emergent beam has an anglur divergence of 2°. The size of the aperture is

A. 180 m

B. 18 μm

C. 1.8 m

D. 0.18 m

Answer: B

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42. In a single slit diffraction of light of wavelength λ by a slit of width e, the size of

the central maximum on a screen at a distance b is

A. $1b\lambda + e$

B. $\frac{2b\lambda}{e}$

C. $\frac{2b\lambda}{e} + e$

D. $\frac{2b\lambda}{e} - e$

Answer: C

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43. The angular width of the central maximum of the diffraction patternn in a single slit (of width a) experiment, with λ as the wavelenth of light, is

A. $\frac{3\lambda}{2a}$

B. $\frac{\lambda}{2a}$

C. $\frac{2\lambda}{a}$

D. $\frac{\lambda}{a}$

Answer: C

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44. A single slit Fraunhofer diffraction pattern is formed with white light. For what wavelength of light the third secondary maximum in the diffraction pattern coincides with the secondary maximum in the pattern for red light of wavelength 6500 Å ?

A. 4400 Å

B. 4100 Å

C. 4642.8 Å

D. 9100 Å

Answer: C

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45. In a diffraction pattern due to single slit of width $'a'$, the first minimum is observed at an angle 30° when light of wavelength 5000Å is inclined on the slit. The first secondary maximum is observed at an angle of:

A. $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$

B. $\sin^{-1}\left(\frac{1}{4}\right)$

C. $\sin^{-1}\left(\frac{3}{4}\right)$

D. $\sin^{-1}\frac{\sqrt{3}}{2}$

Answer: C

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46. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance

between the first dark fringes on either side of the central bright fringe is

A. 1.2 cm

B. 1.2 mm

C. 2.0 cm

D. 2.0 mm

Answer: D

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47. In Fraunhofer diffraction experiment, L is the distance between screen and the obstacle, b is the size of obstacle and λ is wavelength of incident light. The general condition for the applicability of Fraunhofer diffraction is :

A. $\frac{b^2}{L\lambda} > > 1$

B. $\frac{b^2}{L\lambda} = 1$

C. $\frac{b^2}{L\lambda} < < 1$

D. $\frac{b^2}{L\lambda} \neq 1$

Answer: C

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48. The distance between the first and the sixth minima in the diffraction pattern of a single slit is 0.5 mm. The screen is 0.5 m away from the slit. If the wavelength of light used is 5000 Å. Then the slit width will be

A. 5 mm

B. 2.5 mm

C. 1.25 mm

D. 1.0 mm

Answer: B

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49. Red light of wavelength 625 nm is incident normally on a optical diffraction grating with 2×10^5 lines/m. Including central principal maxima, how many maxima may be observed on a screen which is far from the grating?

A. 15

B. 17

C. 8

D. 16

Answer: B

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50. A parallel monochromatic beam of light is incident normally on a narrow slit. A diffraction pattern is formed on a screen placed perpendicular to the direction of the

incident beam. At the first minimum of the diffraction pattern, the phase difference between the rays coming from the two edges of the slit is

A. 0

B. $\frac{\pi}{2}$

C. π

D. 2π

Answer: D

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51. The source is at some distance from an obstacle. Distance between obstacle and the point of observation is b and wavelength of light is λ. Then the average distance of nth Fresnel zone will be at a distance ...from the point of observation.

A. $\frac{bn\lambda}{2}$

B. $b - \frac{n\lambda}{2}$

C. $b + \frac{n\lambda}{2}$

D. $b - n\lambda$

Answer: C

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52. When a compact disc is illuminated by a source of white light, coloured lines are observed. This is due to

A. dispersion

B. diffraction

C. interference

D. refraction

Answer: B

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53. When light is incident on a diffraction grating, the zero order principal maximum will be

A. spectrum of the colours

B. white

C. one of the component colours

D. absent

Answer: B

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Exercise 2 Miscellaneous Problems

1. Light propagates 2 cm distance in glass of refractive index 1.5 in time t_0. In the same time t_0, light propagates a distance of 2.25 cm in medium. The refractive index of the medium is

A. $4/3$

B. $3/2$

C. $8/3$

D. None of these

Answer: A

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2. Two waves of same frequency and same amplitude from two monochromatic sources are allowed to superpose at a certain point. If in one case the phase difference is 0 and in

other case it is $\pi/2$ then the ratio of the intensities in the two cases will be

A. $1:1$

B. $2:1$

C. $4:1$

D. None of these

Answer: B

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3. Light of wavelength $500nm$ is used to form interference pattern in Young's double slit experiment. A uniform glass plate of refractive index 1.5 and thickness $0.1mm$ is introduced in the path of one of the interfering beams. The number of fringes which will shift the cross wire due to this is

A. 100

B. 200

C. 300

D. 400

Answer: A

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4. Following diffraction pattern was obtained using a diffraction grating using two different wavelengths λ_1 and λ_2. With the help of the figure identify which is the longer wavelength and their ratios ?

A. λ_2 is long than λ_1 and the ratio of the longer to the shorter wavelength is 1.5

B. λ_1 is longer than λ_2 and the ratio of the longer to the shorter wavelength is 1.5

C. λ_1 and λ_2 are equal and their ratio is 1.0

D. λ_2 is longer than λ_1 and the ratio of the longer to the shorter wavelength is 2.5

Answer: C

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5. In Young's double slit experiment, one of the slit is wider than other, so that amplitude of the light from one slit is double of that from other slit. If I_m be the maximum intensity, the resultant intensity I when they interfere at phase difference ϕ is given by:

A. $\frac{I_m}{9}(4 + 5\cos\phi)$

B. $\frac{I_m}{3}\left(1 + 2\cos^2\frac{\phi}{2}\right)$

C. $\frac{I_m}{5}\left(1 + 4\cos^2\frac{\pi}{2}\right)$

D. $\frac{I_m}{2}\left(1 + 8\cos^2\frac{\phi}{2}\right)$

Answer: D

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6. Two light waves having the same wavelength λ in vacuum are in phase initially. Then the first ray travels a path of length L_1 through a medium of refractive index μ_1. Then second ray travels a path of length L_2 throug a medium of refractive index μ_2. The two waves are then combined to observed

interference effects. The phase difference between the two, when they interfere, is

A. $\frac{2\pi}{\lambda}(\mu_1 L_1 - \mu_2 L_2)$

B. $\frac{2\pi}{\lambda}(L_2 - L_1)$

C. $\frac{2\pi}{\lambda}\left(\frac{L_1}{\mu_1} - \frac{L_2}{\mu_2}\right)$

D. $\frac{2\pi}{\lambda}(\mu_2 L_1 - \mu_1 L_2)$

Answer: A

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7. In Young's double slit experiment, the 10th maximum of wavelength λ_1 is at distance of y_1 from the central maximum. When the wavelength of the source is changed to λ_2 , 5th maximum is at a distance of y_2 from its central masximum. Then $\frac{y_1}{y_2}$ is

A. $\frac{2\lambda_1}{\lambda_2}$

B. $\frac{2\lambda_2}{\lambda_1}$

C. $\frac{\lambda_1}{2\lambda_2}$

D. $\frac{\lambda_2}{2\lambda_1}$

Answer: A

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8. Consider sunlight incident on a slit of width 10^4Å . The image seen through the slit shall

A. be a fine sharp slit white in colour at the centre

B. a bright slit white at the centre diffusing to zero intensity at the edges

C. a bright slit white at the centre diffusing to regions of different colours

D. only be a diffused slit white in colour

Answer: A

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9. Two identical radiators have a separation of $d = \lambda/4$ where λ is the wavelength of the waves emitted by either source. The initial phase difference between the sources is $\lambda/4$.

Then the intensity on the screen at a distant point situated at an angle $\theta = 30^\circ$ from the radiators is (here I_0 is intensity at that point due to one radiator alone)

A. I_0

B. $2I_0$

C. $3I_0$

D. $4I_0$

Answer: B

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10. Air has refractive index 1.0003. The thickness of air column, which will have one more wavelength of yellow light (6000Å) than in the same thickness of vaccuum is

A. 2 mm

B. 2 cm

C. 2 m

D. 2 km

Answer: B

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11. Yong's double-slit experiment is carried out by using green, red and blue light, one color at a time. The fringe widths recorded are β_G, β_R and β_B, respectively. Then

A. $\beta_G > \beta_B > \beta_R$

B. $\beta_B > \beta_G > \beta_R$

C. $\beta_R > \beta_B > \beta_G$

D. $\beta_R > \beta_G > \beta_B$

Answer: D

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12. In a certain double slit experimental arrangement interference fringes of width $1.0mm$ each are observed when light of wavelength 5000Å is used. Keeping the set up unaltered, if the source is replaced by another source of wavelength 6000Å, the fringe width will be

A. 1.2 mm

B. 1.5 mm

C. 1.8 mm

D. 2.0 mm

Answer: A

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13. Find the thickness of a plate which will produce a change in optical path equal to half the wavelength λ of the light passing through

it normally. The refractive index of the plate is μ.

A. $\frac{\lambda}{4(\mu-1)}$

B. $\frac{3\lambda}{4(\mu-1)}$

C. $\frac{\lambda}{(\mu-1)}$

D. $\frac{\lambda}{2(\mu-1)}$

Answer: D

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14. A telescope has an objective lens of $10cm$ diameter and is situated at a distance of one kilometre from two objects. The minimum distance between these two objects, which can be resolved by the telescope, when the mean wavelength of light is 5000Å, of the order of

A. 0.5 m

B. 5 m

C. 5 mm

D. 5 cm

Answer: C

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15. A single slit Fraunhofer diffraction pattern is formed with white light. For what wavelength of light the fourth secondary maximum in the diffraction in the diffraction pattern coincides with the third secondary maximum in the pattern for red light of wavelength 6500 Å ?

A. 4055.6 Å

B. 5055.6 Å

C. 4642.8 Å

D. 9100 Å

Answer: B

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16. If white light is used in a biprism experiment, then

A. fringe pattern disappers

B. all fringes will be coloured

C. central fringe will be white others will be coloured

D. central fringe will be dark

Answer: C

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17. How will the diffraction pattern of single slit change when yellow light is replaced by blue light? The fringe will be

A. wider

B. narrower

C. brighter

D. fainter

Answer: B

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18. In Young's double slit experiment, we get 60 fringes in the field of view of monochromatic light of wavelength 4000Å. If we use monochromatic light of wavelength 6000Å, then the number of fringes obtained in the same field of view is

A. 60

B. 90

C. 40

D. 1.5

Answer: C

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19. nth bright fringe if red light $\left(\lambda_1 = 7500 \ \text{Å}\right)$ coincides with (n +1)th bright fringe of green light $\left(\lambda_2 = 6000 \ \text{Å}\right)$ The value of n, is

A. 4

B. 5

C. 3

D. 2

Answer: A

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20. In a biprism experiement, by using light of wavelength 5000Å, $5mm$ wide fringes are obtained on a screen $1.0m$ away from the coherent sources. The separation between the two coherent sources is

A. 1.0 mm

B. 0.1 mm

C. 0.05 mm

D. 0.01 mm

Answer: B

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21. The ratio of intensities of consecutive maxima in the diffraction pattern due to a single slit is

A. $1:4:9$

B. $1:2:3$

C. $1:\frac{4}{9\pi^2}:\frac{4}{25\pi^2}$

D. $1:\frac{4}{\pi^2}:\frac{9}{\pi^2}$

Answer: C

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22. Light of wavelength λ is incident on a slit of width d. the resulting diffraction pattern is observed on a screen at a distance D. the

linear width of the principal maximum is equal to the width of the slit if D equals

A. $\frac{d^2}{2\lambda}$

B. $\frac{d}{\lambda}$

C. $\frac{2\lambda^2}{d}$

D. $\frac{2\lambda}{d}$

Answer: A

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23. In a Young's double slit experiment, the two slits act as coherent sources of waves of equal amplitude A and wavelength λ in another experiment with the same arrangement the two slits are made to act as incoherent sources of waves of same amplitude and wavelength. if the intensity at the middle point of the screen in te first case is I_1 and in te second case I_2 then the ratio $\frac{I_1}{I_2}$ is

A. 4

B. 2

C. 1

D. 0.5

Answer: B

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24. A narrow slit of width 2 mm is illuminated by monochromatic light fo wavelength 500nm. The distance between the first minima on either side on a screen at a distance of 1 m is

A. 5 mm

B. 0.5 mm

C. 1 mm

D. 10 mm

Answer: B

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25. In Young's experiment one slit is covered with a blue filter and the other (slit) with a yellow filter then the interference pattern

A. Will be blue

B. Will be yellow

C. Will be green

D. Will not be formed

Answer: D

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26. A micture of light, consisting of wavelength 590nm and an unknown wavelength, illuminates Young's double slit and gives rise

to two overlapping interference patterns on the scree. The central maximum of both lights coincide. Further, it is obseved that the third bright fringe of known light coincides with the 4th bright fringe of the unknown light. From this data, the wavelength of the unknown light is:

A. 393.4 nm

B. 885.0 nm

C. 442.5 nm

D. 776.8 nm

Answer: C

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27. Find the ratio of intensities at the two points X and Y on a screen in Young's double slit experiment, where waves from the two source S_1 and S_2 have path difference of zero, and $\lambda/4$ respectively.

A. $3:2$

B. $2:1$

C. $\sqrt{2}:1$

D. $4:1$

Answer: B

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28. The wavelength of the light used in Young's double slit experiment is λ. The intensity at a point on the screen is I, where the path difference is $\frac{\lambda}{6}$. If I_0 denotes the maximum intensity, then the ratio of I and I_0 is

A. $\frac{1}{2}$

B. $\frac{\sqrt{3}}{2}$

C. $\frac{1}{\sqrt{2}}$

D. $\frac{1}{4}$

Answer: D

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29. In Young's double slit experiment the two slits are d distance apart. Interference pattern is observed on a screen at a distance D from

the slits. A dark fringe is observed on the screen directly opposite to one of the slits. The wavelength of light is

A. $\frac{D^2}{2d}$

B. $\frac{d^2}{2D}$

C. $\frac{D^2}{d}$

D. $\frac{d^2}{D}$

Answer: D

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30. In a Young's double slit experiment (slit distance d) monochromatic light of wavelength λ is used and the figure pattern observed at a distance L from the slits. The angular position of the bright fringes are

A. $\sin^{-1}\left(\frac{n\lambda}{d}\right)$

B. $\sin^{-1}\left(\frac{\left(n+\frac{1}{2}\right)\lambda}{d}\right)$

C. $\sin^{-1}\left(\frac{n\lambda}{L}\right)$

D. $\sin^{-1}\left(\frac{\left(n+\frac{1}{2}\right)\lambda}{L}\right)$

Answer: A

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31. A parallel beam of light of wavelength 500 nm falls on a narrow slit and the resulting diffraction pattern is observe on screen 1 m away. It is observed that the first minimum is at a distance of $2.5mm$ from the centre of the screen. Find the width of the slit.

A. 0.2 mm

B. 0.3 mm

C. 0.4 mm

D. 0.5 mm

Answer: A

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32. A parallel beam of light of wavelength 6000Å gets diffracted by a single slit of width 0.3 mm. The angular position of the first minima of diffracted light is :

A. 6×10^{-3} rad

B. 1.8×10^{-3} rad

C. 3×10^{-3} rad

D. 2×10^{-3} rad

Answer: D

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33. Two stars are situated at a distance of 8 light years from the earth. These are to be just resolved by a telescope of diameter 0.25 m. If

the wavelength of light used is 5000 Å, then the distance between the stars must be

A. $3 \times 10^{10} m$

B. $3.35 \times 10^{11} m$

C. $1.95 \times 10^{11} m$

D. $4.32 \times 10^{10} m$

Answer: C

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34. Two luminous point sources separated by a certain distance are at 10 km from an observer. If the aperture of his eye is $2.5 \times 10^{-3} m$ and the wavelength of light used is 500 nm, the distance of separation between the point sources just seen to be resolved is

A. 12.2 m

B. 24.2 m

C. 2.44 m

D. 1.22 m

Answer: C

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35. The condition for diffraction of mth order minima is

A. $d\sin\theta_m = m\lambda, m = 1, 2, 3, \ldots$

B. $d\sin\theta_m = \frac{m\lambda}{2}, m = 1, 2, 3, \ldots$

C. $d\sin\theta_m = (m+1)\frac{\lambda}{2}, m = 1, 2, 3, \ldots$

D. $d\sin\theta_m = (m-1)\frac{\lambda}{2}, m = 1, 2, 3, \ldots$

Answer: A

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36. Light of wavelength 6328Å is incident normally on a slit of width 0.2 mm. Angular width of the central maximum on the screen will be :

A. 0.36°

B. 0.18°

C. 0.72°

D. 0.09°

Answer: B

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37. Maximum diffraction takes place in a given slit for

A. γ-rays

B. ultraviolet light

C. infrared light

D. radiowaves

Answer: D

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38. In a double slit experiment, the two slits are 1 mm apart and the screen is placed 1 m away. A monochromatic lightg of wavelength 500 nm is used, what will be the width of each slit for obtaining ten maxima of double slit

within the central maxima of single slit pattern ?

A. 0.2 mm

B. 0.1 mm

C. 0.5 mm

D. 0.02 mm

Answer: A

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39. A fringe width of a certain interference pattern is $\beta = 0.002$ cm What is the distance of 5th dark fringe centre?

A. $1 \times 10^{-2} cm$

B. $11 \times 10^{-2} cm$

C. $13 \times 10^{-3} cm$

D. $3.28 \times 10^{6} cm$

Answer: C

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40. Calculate the resolving power of a telescope when light of wavelength $540nm$ is used. Diameter of objective lens is $6cm$.

A. $9.1 \times 10^{-4} \text{rad}^{-1}$

B. $0.1 \times 10^{-4} \text{rad}^{-1}$

C. $5 \times 10^{-4} \text{rad}^{-1}$

D. $6 \times 10^{-4} \text{rad}^{-1}$

Answer: B

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1. Interference fringes are produced on a screen by using two light sources of intensities / and 9/. The phase difference between the beams $\frac{\pi}{2}$ is at point P and πat point Q on the screen. The difference between the resultant intensities at point P and Q is

A. 2I

B. 4I

C. 6I

D. 8I

Answer: C

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2. Two coherent sources P and Q produce interference at point A on the screen where there is a dark band which is formed between 4th bright band and 5th bright band. Wavelength of light used is 6000 Å. The path difference between PA and QA is

A. $1.4 \times 10^{-4} cm$

B. $2.7 \times 10^{-4} cm$

C. $4.5 \times 10^{-4} cm$

D. $6.2 \times 10^{-4} cm$

Answer: B

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3. The distances of a point on the screen from two slits in biprism experiment is 1.8×10^{-5} m and 1.23×10^{-5} m if wavelength of light

used is 6000 Å then fringe formed at that point is

A. 10th bright

B. 10th dark

C. 9th bright

D. 9th dark

Answer: B

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4. Two coherent monochromatic light beams of intensities I and 4I are superposed. The maximum and minimum possible intensities in the resulting beam are

A. 3I and 2I

B. 4I and 5I

C. 16I and 3I

D. 25I and I

Answer: D

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5. In young double slit experiment the ratio of intentsities of bright and dark bands is 16 which means

A. the ratio of their amplitudes is 5

B. intensities of individual sources are 25 and 9 units respectively.

C. the ratio of their amplitudes is 4

D. intensities of individual sources are 4 and 3 units respectively.

Answer: B

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6. Two coherent sources of intensity ratio α interfere in interference pattern $\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$ is equal to

A. $\frac{2\alpha}{1+\alpha}$

B. $\frac{2\sqrt{\alpha}}{a+\alpha}$

C. $\frac{2\alpha}{1\sqrt{\alpha}}$

D. $\frac{1+\alpha}{2\alpha}$

Answer: B

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7. In a single slit diffraction pattern intensity and width of fringes are

A. unequal width

B. equal width

C. equal width and equal intensity

D. unequal width and unequal intensity

Answer: D

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8. In Young's double slit experiment, if the slit widths are in the ratio $1:9$, then the ratio of the intensity at minima to that at maxima will be

A. 1

B. $\frac{1}{9}$

C. $\frac{1}{4}$

D. $\frac{1}{3}$

Answer: C

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9. A plane wave front of wavelength λ is incident on a single slite of width b. What is the angular width for secondary maximum ?

A. $\frac{\lambda}{2b}$

B. $\frac{\lambda}{b}$

C. $\frac{2\lambda}{b}$

D. $\frac{b}{\lambda}$

Answer: B

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10. If the aperature of a telescope is decreased resolving power will

A. increase

B. decrease

C. remain same

D. zero

Answer: B

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11. In an interference experiment, third bright fringe is obtained at a point on the screen with a light of 700 nm . What should be the wavelength of the light source in order to obtain 5th bright fringe at the same point

A. 500 nm

B. 630 nm

C. 750 nm

D. 420 nm

Answer: D

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12. If fringe width is 0.4 mm, the distance between fifth bright and third dark band on same side is

A. 1 mm

B. 2 mm

C. 3 mm

D. 4 mm

Answer: A

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13. In an interference experiment, the spacing between successive maxima or minima is

(Where the symbols have their usual meanings)

A. $\lambda d / D$

B. $\lambda D / \lambda$

C. dD / λ

D. $\lambda d / 4D$

Answer: B

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14. If young's douel slit experiment is performed in water

A. the fringe width will decrease

B. the fringe width will increase

C. the fringe width will remain unchanged

D. there will be no change

Answer: A

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15. In Young's double slit experiment, 62 fringes are seen in visible region for sodium light of wavelength 5893Å. If violet light of wavelength 4358Å, is used in place of sodium light, then number of fringes seen will be

A. 54

B. 64

C. 74

D. 84

Answer: D

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16. In a Fresnel biprism experiment, the two positions of lens give separation between the slits as 16cm and 9cm respectively. What is the actual distance of separation?

A. 12.5 cm

B. 12 cm

C. 13 cm

D. 14 cm

Answer: B

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17. The path difference produced by two waves is 3.75 μm and the wavelength is 5000 Å. The point is

A. uncertain

B. dark

C. partially bright

D. bright

Answer: B

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18. A Young's double slit experiment is conducted with slit separation 10mm, where the screen is 2m away from the slits. If wavelength of light used is 6000Å , answer the following

Fringe width in mm is

A. 1.15 mm

B. 0.30 mm

C. 0.24 mm

D. 0.12 mm

Answer: A

19. In Young's double slit experiment, a minimum is obtained when the phase difference of super imposing waves is

A. zero

B. $(2n-1)\pi$

C. $n\pi$

D. $(n+1)\pi$

Answer: B

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20. In Young's double slit experiment, wavelength $\lambda = 5000\text{Å}$ the distance between, the slits is $0.2mm$ and the screen is at 200cm

from the slits. The central maximum is at $x = 0$ The third maximum (Taking the central maximum as zeroth maximum) will be at x equal to

A. 5 cm

B. 0.5 cm

C. 1.67 cm

D. 1.5 cm

Answer: D

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21. If the ratio of amplitude of wave is $2:1$, then the ratio of maximum and minimum intensity is

A. $9:1$

B. $1:9$

C. $4:1$

D. $1:4$

Answer: A

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22. If a torch is used in place of monochromatic light in Young's experiment what will happen?

A. Fringe will appear for a moment then it will disappear

B. Fringes will occur as from monochromatic light

C. Only bright fringes will appear

D. No fringe will appear

Answer: D

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23. If the ratio of amplitude of two waves is $4:3$, then the ratio of maximum and minimum intensity is

A. $16:18$

B. $18:16$

C. $49:1$

D. $1:49$

Answer: C

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24. In a double slit experiment, the distance between slits is increased 10 times whereas their distance from screen is halved, then what is the fringe width?

A. It remains same

B. Becomes $\frac{1}{10}$

C. Becomes $\frac{1}{20}$

D. Becomes $\frac{1}{90}$

Answer: C

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